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ILLINOIS HISTORICAL SURVEY

The Wisconsin Pulp and Paper Industry

James I. Clark

The State Historical Society of Wisconsin

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by

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THE WISCONSIN PULP AND PAPER INDUSTRY

by

JAMES I. CLARK

DURING THE REIGN of the Emperor Ho Ti of the Eastern Han dynasty, in the year A.D., 105, a man named Ts'ai Lun discovered how to change scraps of silk into paper. Over the centuries other raw materials were found as the papermaking art spread from China to Japan, along the Mediterranean to the West, and then across the Atlantic to the New World.[1]

A few months before Wisconsin became a state, the Milwaukee *Sentinel and Gazette* announced the arrival of the art on the western shores of Lake Michigan.

"Our Daily, yesterday and part of today's edition was printed on paper manufactured at the new steam mill of Messrs. Ludington and Garland of this City," said the *Sentinel* on March 8, 1848. "This is the first paper made in Wisconsin, but it is hardly a fair specimen of what the manufacturers can do, since their machinery is not yet in perfect trim."

The paper was good enough to take the *Sentinel's* ink-covered handset type. People could read the ads that covered nearly three of the paper's four pages. And discussion of Henry Clay or Zach Taylor as possible Whig Presidential candidates, news on the progress toward statehood, and arguments concerning plank roads *vs.* railroads were quite easy to read.

A later issue of the *Sentinel* described the plant. The main mill was a 45 x 50 feet, two and a half story brick building. Two 25-horsepower steam engines supplied the power for one paper "engine" to turn out 15 reams of paper each day. The whole investment was worth about $10,000.

Business in those early days was good. Paper not disposed of in the young state of Wisconsin could be sold in Chicago. Soon other mills were built in Milwaukee and in nearby towns. The paper industry was on its way in Wisconsin, about 150 years after it had arrived in English America.

Colonial Papermaking

William Rittenhouse, a German-born immigrant, brought the art to the colonies. In 1690 Rittenhouse and three partners opened the first mill near Germantown, Pennsylvania.

Raw materials now were cotton rags, hemp and jute. Cotton worked best, being 91% cellulose—the stuff from which paper is made. The

method of making paper had changed little in 16 centuries.

A poem of the time described the process:

Rags are brought into my mill
Where much water turns the mill.
They are cut and torn and
shredded
To the pulp is water added.
Then the sheets 'twixt felt must be
While I wring them in my press.
Lastly hang them up to dry
Snow-white in glossy loveliness.

Making paper required a great deal of skill plus an unusual amount of patience. If rag pulp was to be used, the cloth had first to be cleaned —no simple job in itself. Then the rags were cut up and pounded by ironshod stampers. The Hollander, a beater using revolving metal blades, probably didn't get to the American colonies until the 18th century.

The pulp, or stock, was beaten until the individual fibers floated in water as separate units. Stock was then stored in chests something like large wine casks, which had outlets to flow the pulp into a dipping vat. The pulp wasn't strained very well; often lumps, splinters, twigs, hair, even insects later showed up in the finished paper.

Three workmen were necessary to the papermaking process. The vatman used a square mould, the bottom of which was a finely woven wire screen. He gathered a thin layer of pulp on the mould, shook it to force excess water through the screen, and passed it on to the coucher. After the pulp had hardened a little, this mechanic removed the sheet and laid it on a piece of felting. After 144 sheets of paper and felting were built up, they were placed in a hand press and much of the remaining water squeezed out.

The layboy then removed the felting and the paper was squeezed again. After that the sheets were placed on "T" bars and hung in the loft for final drying. The paper had to be sized, or given a hard surface with a kind of glue or gelatin. Otherwise it wouldn't take ink, but would act like a blotter.

Rittenhouse turned out about 4 reams of 20 x 30 inch paper each working day. Newspapers were the best customers for the growing business. By the time of the American Revolution there were mills in several colonies. A count in 1810 placed the number of mills at 185, a third of them in Pennsylvania.

Early in the 19th century machines were perfected that greatly increased paper production and lowered the cost. One was the Fourdrinier [fordrin-eár], and the other was the cylinder machine.

The Fourdrinier operated on the same principle as the vatman's mould, except now the wire screen was an endless, mechanically vibrated belt. The pulp moved from the belt to rollers which took out much of the water. The machine was patented in France in 1798 by Nicholas Robert. Two Englishmen, Henry and Sealy Fourdrinier, later took over the idea, perfected it, and gave the machine a name that has persisted to the present. Early Fourdiniers could turn out sheets of paper measuring 12 x 50 feet.

Another Englishman named George Dickenson, had by 1809 perfected a machine which used a perforated cylinder to make paper. Dickenson's

cylinder was covered with fine wire mesh and revolved half in the pulp. It picked up stock from the vat and passed it on to rollers for pressing.

Papermaking machinery arrived in the United States soon after the War of 1812. Hand made paper, except for special orders, rapidly became a thing of the past.[2]

Wisconsin Papermaking

During the 19th century additional mills and increased production used hundreds of tons of cotton rags. Cloth buyers pushed their carts from house to house in cities and at least once a week lined up at the mills for the "peddlers' parade." Scraps of cloth also remained fairly important items of international trade, as they had for several centuries. In 1854, for example, the United States imported 32.6 million pounds and three years later the amount increased to 44.5 million pounds.

Still, that raw material was usually in short supply. Mill owners constantly searched for other ingredients for paper. In the 1830s straw and hay were tried. Some unsatisfactory experiments were made with chemically treated basswood and hemlock. Even corn husks were considered as possible material. Some groundwood pulp, mixed with rag fibers, was used in Germany in the 1760s, but the commercial use of woodpulp didn't begin in American mills until a hundred years later. Straw worked fairly well and by 1850 several large newspapers were using paper made from that source.

Straw, rags and waste paper were the main ingredients in early Wisconsin mills. Rag paper was the principal product of the pioneer Milwaukee mill, which after a year of operation hadn't increased production much. A little over 100 reams came out each week early in 1849. The mill's 40 employes each earned $4 per week, fairly good wages for skilled labor at that time.

By 1856 the Beloit Paper Company, on the banks of the Rock river, was producing quantities of straw paper. This mill was joined by the Rock River Company two years later. In 1868 the two mills consolidated and at that time 50 men and 30 boys and women were employed. Fifteen to eighteen tons of rye straw and 6 to 8 tons of rags went through the mills each day. Nearby, the Whitewater Paper Company was founded in 1860 and soon had a daily production of about 3.5 tons of print and tea paper.

During the Civil War, when newsprint was expensive and scarce, the Milwaukee *Sentinel* itself went into the papermaking business. The *Sentinel's* mill lasted until 1867, when a boiler explosion scattered it about the area. That was a common industrial hazard in those days of imperfect safety valves.

From the southeast corner of Wisconsin the paper industry moved north to the Fox river valley. There papermaking became a very important industry.

The valley was ideal for many reasons. Lake Winnebago formed a natural reservoir of the necessary fresh water. From the head of the lake to Green Bay, about 35 miles, the Fox river fell a total of 170 feet. Rapid descents were well-spaced and offered admirable water-power sites. After

the industry shifted to woodpulp, there were forests close at hand. Transportation to market via the Great Lakes was handy and railroads early connected the area with Milwaukee and Chicago.

In the 1850s three experienced papermaking brothers named Richmond opened a mill at Appleton. The Richmonds at first produced a coarse grain rag and straw wrapping paper. The mill prospered, the market expanded, and more help was brought in from papermaking centers in Massachusetts and Connecticut.

The village of Neenah got a mill in 1865. In 1872 Kimberly–Clark, later to be one of Wisconsin's biggest producers, began operations there. The next few years saw a number of new papermaking establishments. Before long mills dotted the valley from the head of Lake Winnebago to Green Bay, in Menasha, De Pere, Little Chute, Kaukauna and other villages.

The first Neenah plant—known as the Old Red Mill—made mostly rag paper. Rags were gathered locally and shipped in from Milwaukee and Chicago. They were sorted by women and girls, then cut into small pieces and run through the "devil," which beat them and removed much of the dirt. Next came a lime bleach, then steam boiling for about 14 hours.

When the rags were sufficiently clean, men pitchforked them into the "rag engine." There the stock went through another beating and then dropped into receiving tubs, from there to be pumped to the "former," a square, oblong tub.

A large cylinder revolved half submerged in that tub. This cylinder, covered with a wire screen, gathered the liquid pulp. A wool-covered cylinder picked up the sheet of pulp and passed it on to other cylinders which squeezed out the water.

Then the pulp becoming paper went through copper rollers which took out more water. The paper was finished by two polishing rollers at the end of the line, cut into squares and packed for shipment.[3]

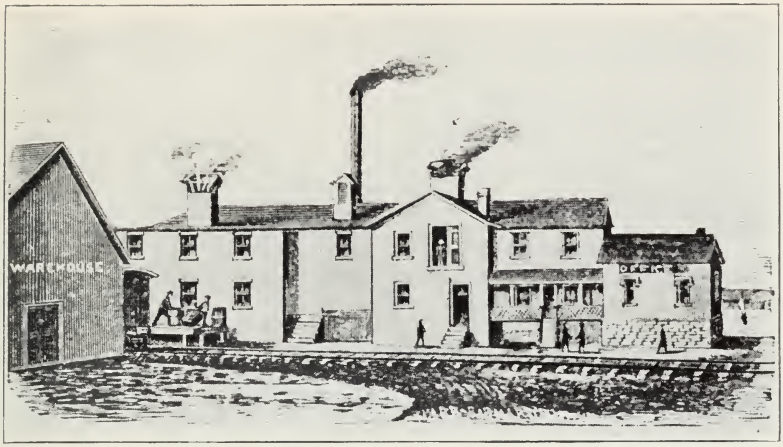
Woodpulp

The Neenah mill turned out 3,000 pounds per day by this method. The paper was rather expensive, selling for about 11¢ a pound or $225 a ton. Editors and publishers used it sparingly. A new process was needed to produce cheaper paper as well as overcome the difficulties of maintaining an adequate raw material supply.

In 1840 a German named Keller discovered a way to make pulp by forcing a block of wood against a grindstone cooled with water. This groundwood process didn't get to the United States until after the Civil War, and to Wisconsin until 1871.

The following year two men at Appleton completed a groundwood pulp mill. This plant used hemlock that was being thrown away at nearby lumber camps. The operation succeeded and other men in Appleton, as well as John A. Kimberly and C. B. Clark in Neenah, took up the process. A few years later paper in large rolls instead of flat sheets was adapted to printing presses and this, plus reduced paper costs, boomed the use of woodpulp.

Water power sites and markets had brought a number of flour mills to the Fox river valley in the days



From 1909 Proceedings

The Neenah Old Red Mill

of extensive wheat growing in Wisconsin. After the Civil War, the business moved west of the Mississippi to be near newly-opened wheat fields. Many Wisconsin millers, rather than attempt to meet that competition, coverted to paper production.

By 1882 at least 20 new paper companies had begun in the Fox river valley and about 2,000 men were employed. By then papermaking was the leading business of the valley and was rapidly spreading to other areas in the state. About this time appeared the sulfite process, a chemical method of making woodpulp. Paper made by this process was stronger and finer than that made from groundwood.

Forest resources and water-power sites attracted papermen to the Wisconsin and Chippewa river valleys. The John Edwards Manufacturing Company was founded at Nekoosa in 1890. Before the century ended a mill was operating at Port Edwards. These mills, together with the Centralia Pulp and Power Company formed the base for what in 1908 became the Nekoosa–Edwards Paper Company.

The Wausau *Central Wisconsin* published a special edition on March 31, 1900, hailing that town's new mills. "An inexhaustible supply of hemlock, spruce and balsam is available in every section of the county," said the editor. Speaking of the Wausau Paper Mill Company, formed the year before, he said, "For wood alone the company will pay out about $40,000 annually. Labor expenses will be in the neighborhood of $75,000 per year."

The Marathon Corporation, which later would have mills in more than one Wisconsin city, was founded at Rothschild in 1909. Wisconsin Rapids, Rhinelander, Tomahawk, Mosinee and Merrill all became papermill towns during the latter part of the 19th and early 20th centuries.

Further west, on the Chippewa, the Eau Claire Pulp and Paper Company was founded in 1882 and eight years later its payroll had been boosted to 40 men. The Park Falls Paper and Pulp Company (later

named the Flambeau Company), began operations in 1895. A mill was erected at Ladysmith. Just prior to World War I, in 1912, one was built at Cornell.

Toward the end of the 19th century the industry returned to Milwaukee. In 1898 the Milwaukee Lace Paper Products Company was organized to make paper and board for containers. Four years after that, the Hummel and Downing Company was formed to make similar items.

By 1900 Wisconsin was recognized as an important paper producer. The state was fifth in papermaking, with New York, Massachusetts, Maine and Pennsylvania holding the first four places.

Mills blossomed in other towns, such as Ashland, Niagara, Marinette, Peshtigo, Oconto Falls and Shawano. In 1910, fifty-seven Wisconsin companies paid 6,000 employes $3.5 million in wages. Products of the pulp and paper industry, annually valued at $26 million, ranked eighth among Wisconsin manufactured goods. On the national level, Wisconsin now placed third in paper production.[4]

Tariff Troubles

Badger state papermakers could view the future optimistically. The industry had grown rapidly and there was no reason to believe it wouldn't continue to expand. Just then, however, a new tariff law presented paper manufacturers with a grave and difficult problem.

Shortly before World War I, American paper mills were turning out a large amount of newsprint to supply the growing demands of the country's newspapers. That kind of paper represented about half of Wisconsin's total 1910 production.

Major competition for American mills came from Canada. That country had rich pulpwood supplies and a growing pulp and paper industry of its own. As domestic forests were logged off, paper companies in the United States imported more and more pulpwood from the north. They wanted those logs to come in duty free, yet wanted a tariff kept on finished paper products from Canada.

On the other hand, American newspaper publishers wanted a cheaper source of newsprint. They wanted the tariff removed from Canadian products. At the same time, many Canadians favored a United States tariff on pulpwood, but not on finished products. Quebec and Ontario even went so far as to allow no pulpwood to be exported.

Then in 1910 the Canadian and United States governments began reciprocal trade discussions. After a lot of negotiation, an agreement was reached. The United States would allow certain products, including pulp and paper and some agricultural goods, to enter the country without duty. In exchange, Canada would place a number of United States items on the free list. Before it went into effect, however, Congress had to approve the arrangement.

Although he favored low tariffs on many manufactured goods, Wisconsin's Senator Robert M. La Follette didn't want farm products on the free list. In fighting against the Canadian agreement, he was joined by other Midwestern senators. La Follette argued that the agreement

Debarkers, where sharp-edged bars tumble logs, remove the bark

would harm American farmers, who would have to compete with Canadian agricultural products. Probably he was also aware of the harm that would be done to the Wisconsin paper industry if reciprocity went through.

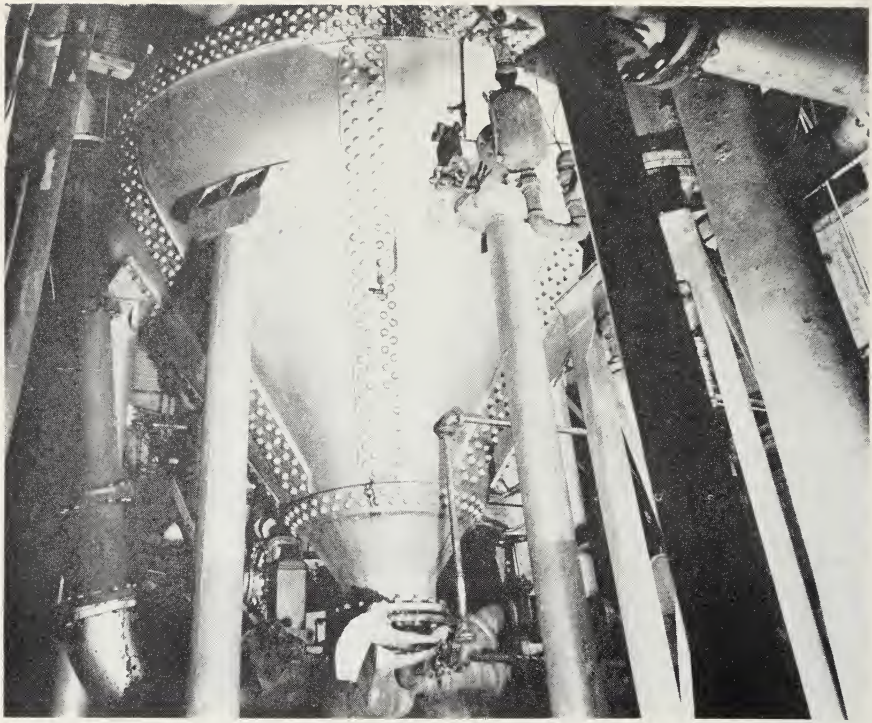
President Taft had to call a special session of Congress to get the agreement ratified. Then it ran into opposition in Canada and was defeated.

Two years later many of the objectives were attained. In the Underwood Tariff Law passed under President Wilson in 1913, pulp and newsprint were placed on the free list. Duties were kept on other kinds of paper products.[5]

Meeting a Challenge

Wisconsin papermakers were faced with a fight for survival as cheaper Canadian newsprint gradually cut into their business. They had to shift to producing other kinds of paper or they would lose a considerable investment.

Paper companies got busy. Chemists, physicists and engineers were put to work on the problem of finding new products. Carefully controlled experiments and test runs were made. Different pulp mixtures and machines were tried. Papermaking changed from the "see it, feel it, taste it" method to scientifically controlled production.



The digester, where pulpwood is chemically cooked

The results were dramatic. Many Wisconsin mills went into specialty production. Light weight papers, tissue paper, glazed, glassine and serum-resisting wrapping papers flowed out of Wisconsin mills. Many companies came to devote most of their efforts to the production of toilet tissue, absorbent wadding, crepe wadding and insulating papers. Some mills became especially known for high grade book and magazine papers. Before long, newsprint was a minor Wisconsin product.

What had appeared to be a crippling blow to the Wisconsin paper industry actually was a stimulant that resulted in far greater production and value of goods. Before Canadian newsprint came in free, 350,000 cords of hemlock, balsam and spruce were used annually in Wisconsin mills. Twenty years later, wood consumption had reached one million cords each year. The number of employes had more than doubled.

Wisconsin's depleted forests were far from sufficient to supply the raw material demand. Logs and pulp were imported from Canada, Oregon, Washington, Montana, Minnesota and Michigan. Some came from Sweden and Finland. Other raw materials came from a variety of places. Sulphur was imported from Louisiana and Texas, lime from Missouri and Michigan, rosin from Alabama and Georgia, and salt cake

from Canada. Clay came from Alabama and England and coal (for power) from Illinois, Pennsylvania and West Virginia. All these materials were used in chemical processes of producing pulp and paper.

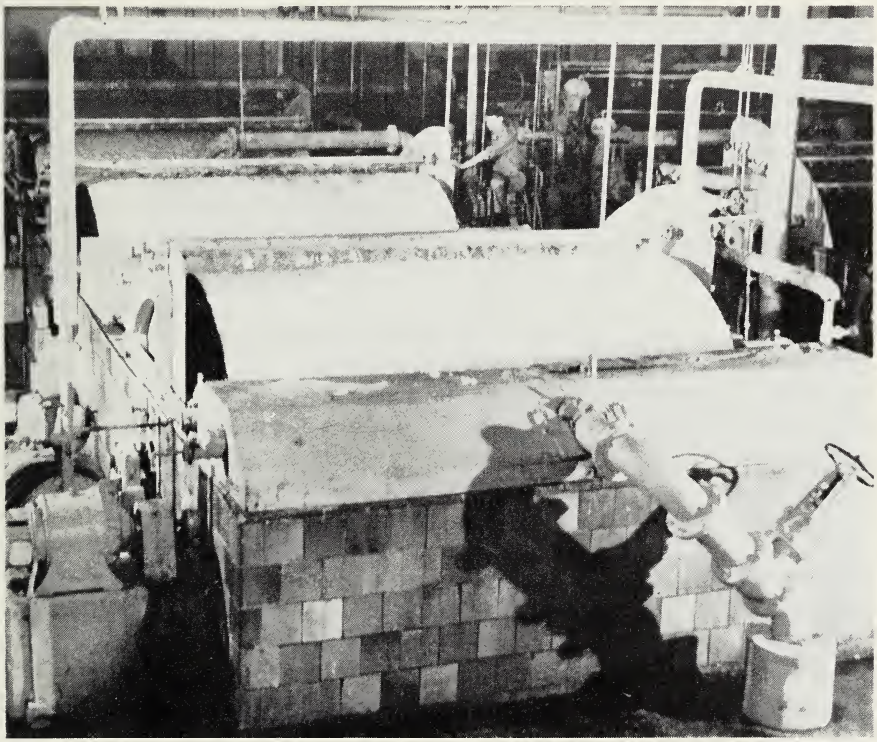
Woodpulping Processes

By 1930 Wisconsin had a secure position as a producer of specialty papers. The state was the second largest manufacturer of pulp and paper products, just behind Maine. The industry ranked fifth among Wisconsin manufactures, trailing auto parts and bodies, butter and cheese, foundry and machine products. Paper from state mills had an annual value of $93 million.[6]

In the modern era woodpulp has been the main ingredient for Wisconsin paper. Only three mills produce high quality bond rag paper. They are Kimberly–Clark at Neenah, Gilbert at Menasha, and Whiting–Plover at Stevens Point. The rise of synthetic fibers has made rags for pulping even more scarce than they used to be.[7]

As science has contributed to change in papermaking, so has it changed the beginning of the woodpulping process. Trees are harvested differently than in the days when lumberjacks logged off the nation's virgin white pine. Generally, gas-operated chain saws, even mechanical saws on wheels, are now used to

Drums where pulp is washed after bleaching



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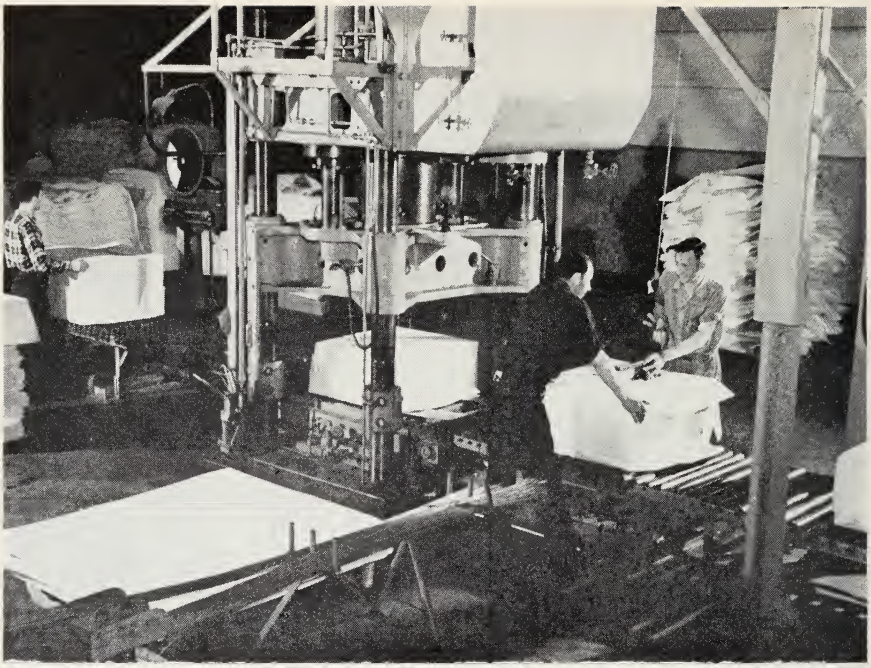


Preparing sheets of chemical pulp for shipment

cut the timber. Cats drag logs to loading points. Trucks and railroad cars are loaded by mechanical claws. Some timber is floated to mills, some goes on railroad cars, and some is taken across the Great Lakes by self-propelled barges.

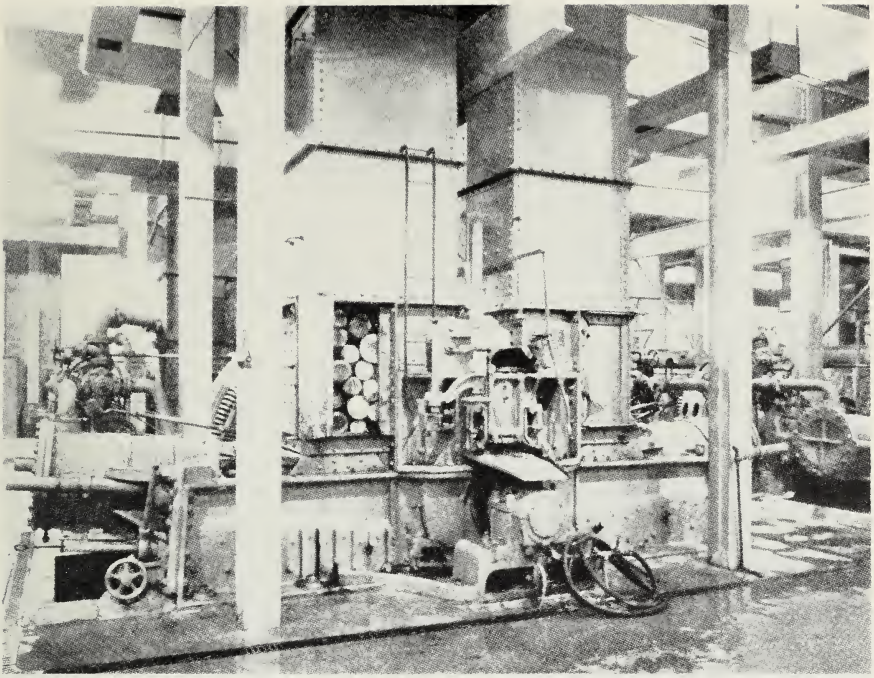
After pulpwood has been run through debarkers and the bark removed, it is ready for one of five methods of producing pulp. One process is mechanical, three are chemical and the fifth is a combination called semichemical.

The mechanical or groundwood process is the cheapest and yields the highest return. As the cellulose, gums, and other wood elements are all ground together, little of the log is lost. Strength of groundwood pulp is low, however. The fibers are short and brittle. Usually it is mixed with chemical pulp before being made into paper. Newsprint and cheaper magazine and catalog papers are made mostly of groundwood, as are certain fiber and building boards. Spruces and balsam, and some pine, hemlock and hardwoods are used in this process.

The three chemical processes are similar except that different compounds are used to cook the wood. The sulfite process uses an acid, the sulfate process an alkali and the soda process a kind of salt. As only the cellulose (about 50% of wood) is used here, chemical processes yield only about one ton of pulp for two tons of wood. Yet the product is much stronger than groundwood.

In the semichemical process, the newest method of pulping, wood is partially cooked and then beaten mechanically. This gives more pulp per ton of wood than the purely chemical methods.

Logs to be cooked chemically are



Courtesy News Print Service Bureau

High magazines, where whirring grindstones make groundwood pulp

first reduced to small chips. The chips are sent to a digester—a huge upright pressure cooker, sometimes 55 feet high and 18 feet in diameter.

The cooking is done with a combination of chemical "liquor" and steam at a very high temperature. During the process the cellulose is separated from the other elements in the wood.

After several hours cooking, the waste liquor is drained and the pulp, resembling a wet mass of wool, receives several washings. Then it is thickened and bleached. After additional washing it is rolled into sheets. These sheets might be mixed with other pulp in the same mill, or might be shipped for papermaking in another part of the country.

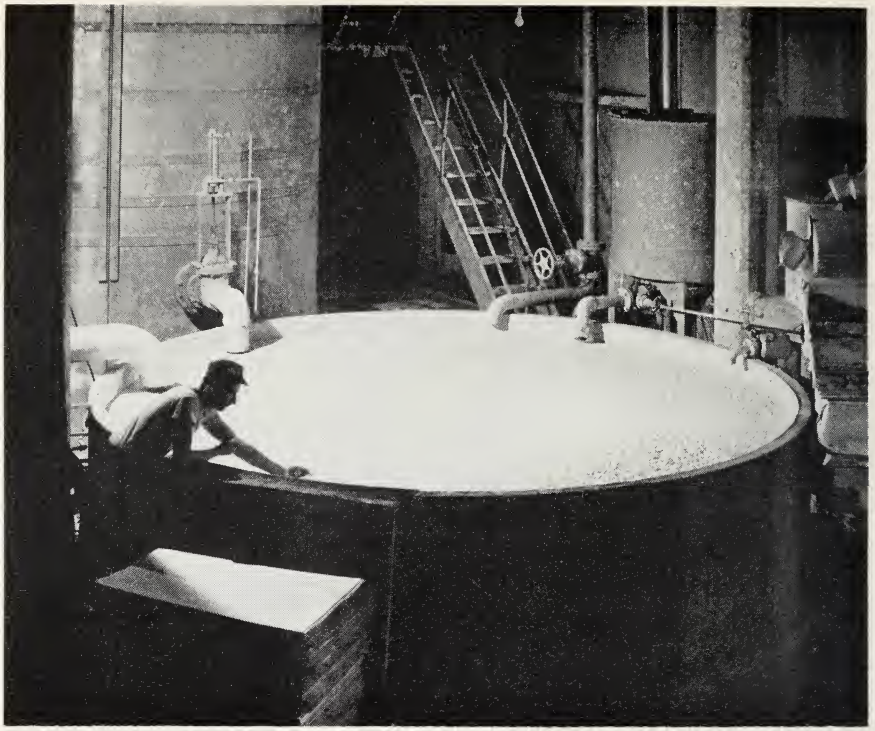
Groundwood is not cooked. Hydraulic pressure is used to force whole logs against whirring grindstones. The result is a finely ground mass which looks something like yellow corn meal mush.

Groundwood pulp then goes to beaters. Here alum and rosin for sizing, clay for surface finish and white color, and the proper amount of chemical pulp are added. The mixture is beaten once more and the pulp, now 99% water, is ready to become paper.

Papermaking

That job is done by the Fourdrinier. Pulp is poured onto a vibrating wire mesh belt which mixes the fibers and starts them on their way. Here a lot of water is lost. dropping through the screen and being drained off below.

From the vibrating screen the mixture is picked up and sent through a large number of cylinders which steam and press out more water. At the end, a series of heavy smooth



Mixing pulp, chemicals and water

rollers called calendars iron the paper and give it a smooth surface. The paper has traveled about 300 feet in a few seconds. A vast amount of liquid pulp has been changed into 10,000 feet of paper in a one ton roll.

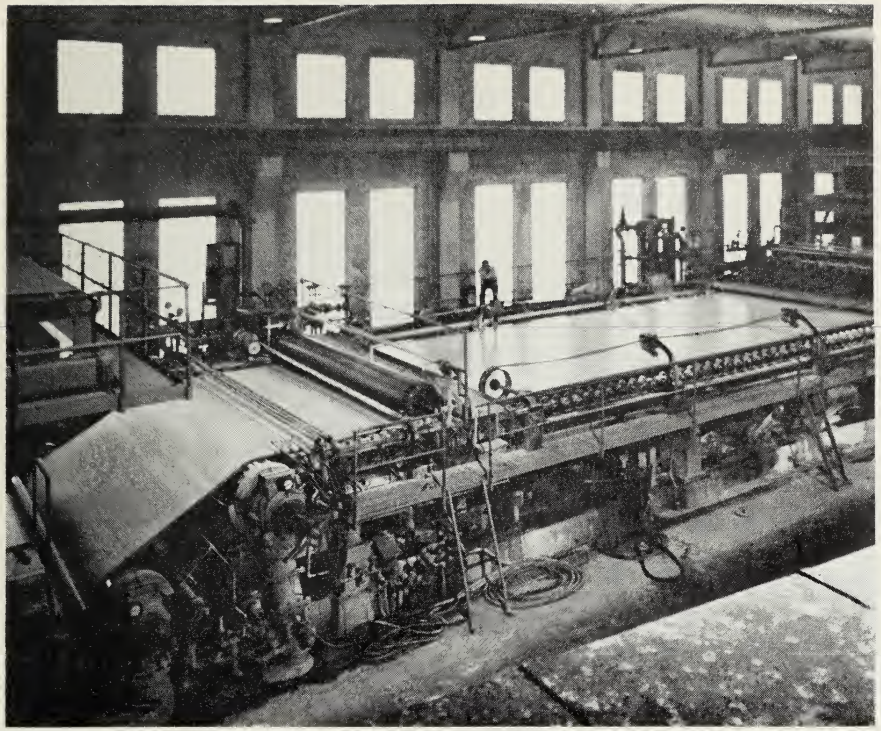
If the paper is newsprint, it is shipped in the roll. If destined for typing or writing paper, it is unwound and run through knives which cut it into desired sizes.

Paper that is to become boxes, milk bottle cartons, tissues or some other specialty, goes through other processes. Essentially though, the method of making paper is the same for all products.

Much of the machinery used by Wisconsin paper companies is made by manufacturers within the state. Many machine shops and heavy equipment plants grew up practically side by side with paper mills. One of the largest is the Beloit Iron Works, founded in the 1880s, which makes presses as well as Fourdrinier paper machines.

A number of Appleton firms supply equipment to mills of that area. The Appleton Machine Company, which began as a blacksmith shop in 1857, turns out thickeners, pulp washers, and other machinery. The Appleton Woolen Mills manufacture felt looms. Fourdrinier screens are made by the Appleton Wire Works. The Valley Iron Works of that city produces a wide variety of papermaking equipment.

In nearby De Pere the C. A. Lawson Company makes roll wrappers. At Green Bay the Hudson–Sharp Machine Company turns out napkin folders, crepeing machines (for making corrugated boxes) and waxing machines. The Paper Converting Ma-



The Fourdrinier, wet end

chine Company and the Alwin Manufacturing Company of that city both make paper towel and wax paper dispensers.

The H. G. Weber and Company plant at Kiel produces bag machines and other equipment. The D. J. Murray Company of Wausau turns out heavy duty papermill machinery. Allis–Chalmers in Milwaukee manufactures barkers, pumps, dynamos and other heavy equipment.

Research and Conservation

Closely connected with expansion and replacement in the industry has been the C. R. Meyer and Sons Company of Oshkosh, a large construction firm. This company has been responsible for building many pulp and paper mills. It has also constructed power houses, dams, and hydro-electric stations.

During the journey from one machine to another, pulp and paper is carefully tested to insure high quality. Samples are taken to determine the proper chemical content and mixture. Paper is tested to see how much force is needed to tear it and to burst it. It is examined to see how many times it can be folded. Its smoothness and weight are carefully noted.

Testing and experimentation are carried on outside the actual operation of a paper mill, too. Many new processes have resulted from the work of a federal agency located in Madison, Wisconsin. That is the Forest Products Laboratory.

Interest in forest conservation was growing at the beginning of the 20th century, but there was little organized research in forest products. Some men in the United States Forest Service thought a central lab-

Steam heated drier rollers

oratory should be created to explore the various aspects of wood use.

Unable to get Congressional help at that time, these men looked for a college or university that might help establish such a plant. The University of Wisconsin, under the well-known conservationist President Charles Van Hise, made the best offer. In 1910 Forest Products Laboratory was opened.

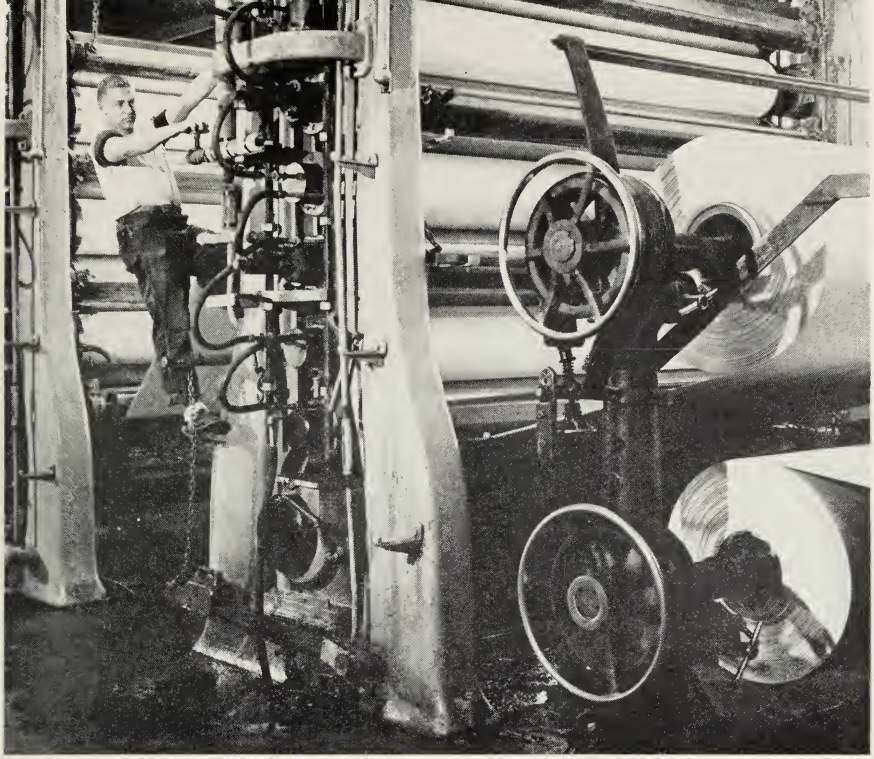
The laboratory quickly proved its worth to industries connected with wood. Those in foreign countries as well as those in the United States have benefited. Forest Products now has over 400 employes. About half of them are scientists concerned with various experiments in the use of wood and wood products.

Much work has been done with veneer, plywood and prefabrication. New methods of seasoning and grading lumber have been discovered. Various tests have been run on ways to glue wood. By-products formerly wasted, such as gums, rosins and sawdust, have been put to work.

By experimenting with different kinds of wood and pulping processes, the laboratory has helped the paper industry also. Forest Products houses complete equipment for making pulp and paper, only on a smaller scale than would be found in a regular paper mill.

One of the first experiments concerned the pulping qualities of 90 different kinds of wood. Another had to do with preventing decay in pulp that had to be stored. The laboratory was responsible for pioneer work in developing the semichemical pulping process. This has resulted in the use of more and more hardwoods.

During World War II, Forest



Dry end of Fourdrinier, calendaring the paper

Products developed a number of new papers and experimented with several kinds of containers for use in the armed services.

The Wisconsin paper industry has done a lot to help itself. In 1929 a group of 16 companies founded the Institute of Paper Chemistry, located at Lawrence College in Appleton.

The Institute not only looks for better ways to produce pulp and paper, but also trains men in the highly complex scientific skills so necessary to modern papermaking. Each year a number of carefully selected men graduate from there to take jobs in various branches of the industry. The Institute has also built up a research library second to none.

More than one hundred organizations are now members of this agency. The Institute has many times proved its worth with successful experiments and trained personnel. Cooperating groups have shared in those benefits.

Another industry-sponsored idea came into being in 1944. The year before, the Wisconsin river valley had held a Victory Pulpwood Campaign. In October 1943, one hundred trucks piled with pulpwood moved down the main street of Tomahawk, showing the value of a nearby supply of raw material to the farmers who had cut the wood.

This demonstration gave paper mill owners an idea. If enthusiasm for raising trees could be aroused, a great many people would benefit. Conservation of natural resources would be furthered. A good source of raw material would be created. Farmers and others who raised trees would benefit financially. Ten north central Wisconsin paper companies

cooperated to found Trees For Tomorrow, Inc. And then things started to happen.

A reforestation institute was set up at Rhinelander. Free trees were distributed. Forestry scholarships for high school graduates were established. Laboratory forests were planted—the 900 acre Merrill Memorial and the 12,000 acre Oneida County Memorial. More than 30 schools now have their own forests. Field institutes offer conservation courses for colleges, and summer camp schools have been established. In 1955 a total of 104 high schools sent 1,200 students to three day workshops in spring and fall camps.

The first trees were distributed in 1945. Less than 10 years later the organization was passing out 25 million seedlings annually. Private owners were building up a reserve of over 10 million acres of forest land, half of that in farm woodlots. Said the Merrill *Herald* recently:

> You can't travel but a few miles on any highway before you meet trucks loaded with logs or bolts. These are all coming from small operations. Selective cutting is becoming a general practice. Small wood lots properly cared for will produce a large revenue over the years.

Echoed the Wisconsin Rapids *Tribune:*

> There isn't a single large tract of standing timber remaining in Lincoln county and it's been several years since there's been a large scale logging operation. Nevertheless at this time of year you can't travel but a few miles on any highway before you meet a large truckload of logs or pulpwood.

Much remains to be done, however. In the 1950s Wisconsin mills still imported two-thirds of the 1.5 million cords of pulpwood used each year. There still remain thousands of acres in the state that could profitably be planted with trees.[9]

Waste Disposal

The paper industry has broadened its conservation practices to include commercial uses for the sulfite waste materials that come from the mills. For many years paper mills took the easy way of getting rid of that waste: they dumped used cooking liquor into streams. As the liquor absorbed much of the oxygen in the water, this was hard on fish. For a few miles downstream from every mill fish were either killed or fled the area.

Continued protest from sport and commercial fishermen and resort owners resulted in research to find other ways of waste disposal. A surprising number of new products came into being.

The Marathon Corporation, for example, began experiments in 1927. Within a few years, small quantities of lignosulfonate tans were produced. Later these were used in manufacturing boiler scale inhibitors, and as ingredients for auto tires and storage batteries. They also were used in synthetic fiber dyestuffs, pesticides, gypsum board, cement, and many other products.

In 1937 a plant was completed at the Marathon Rothschild site to make vanillan, an artificial vanila flavoring. This part of the paper business was operated by the Salvo Chemical Company, owned by a

New York drug firm. By 1951, vanillan sales had outstripped production and plant expansion became necessary.

Recently, the Marathon Corporation demonstrated a method of making steam by using waste sulfite. The liquor, mixed with air, is subjected to 1,200 degrees of heat. That destroys the organic matter and produces steam. The steam can be used for power and the chemicals collected and reused in the papermaking processes.

Kimberly–Clark discovered a way to convert waste liquor into a spray for roads. Counties can get it practically free for the hauling. The liquid works well on roads that contain a mixture of gravel and clay and it keeps dust at a minimum.

The Rhinelander Paper Company converts its spent sulfite liquor into a high protein yeast. This is used in poultry and livestock feed.

Consolidated Paper Company and Nekoosa–Edwards store waste material in ponds. After the oxygen-absorbing properties have disappeared, the material is slowly filtered into streams.[10]

The Industry and the State

With research and experimentation, the Wisconsin paper industry has overcome many problems and adapted itself to many new conditions. Now, in contrast to the early years, little rag paper is made. Woodpulp has taken the place of rags even in the manufacture of many fine grade writing papers. Now the industry produces no newsprint, in contrast to its huge output of 40 years ago. Yet thanks to the manufacture of high grade specialty papers, the state industry now ranks first in the nation in terms of product value, while placing second in total tonnage.

At present, the industry pays around 32,000 employes more than $138 million while turning out 1.5 million tons of paper products annually. Among Wisconsin products, pulp and papermaking ranked fifth in value in 1953. Machinery, electrical machinery, transportation equipment and food processing held the first four places.

Thirty-two Wisconsin communities have one or more paper mills. In a number of those cities, the mills represent the major source of employment. In addition, Appleton, Green Bay and other communities have manufacturing plants closely tied to papermaking.

The industry furnishes a market for locally grown timber. With a greater use of hardwoods, the importance of local resources should increase. A recent survey indicated that Wisconsin is well-stocked with oak, for example. The Nekoosa–Edwards Company has been experimenting with that wood for pulp. Mills at Tomahawk, Green Bay and Rhinelander have used the semichemical process with hardwoods.

Said the editor of the Milwaukee *Sentinel and Gazette* when Wisconsin's first mill began production: "Such an establishment adds materially to the business of our city and furnishes evidence of Wisconsin's growth and prosperity." The paper industry has continued to do that for many cities. It has grown with the state.[11]

NOTES

[1] Dard Hunter, *Papermaking in Pioneer America* (Philadelphia, 1952), 1–9.

[2] *Ibid.*, 9–20; Lockwood Trade Journal Company, *The Progress of Paper* (New York, 1947), 31–61.

[3] Howard Publishing Company, *1848–1948, A History of the Wisconsin Paper Industry* (Chicago, 1948), 5–54; Publius V. Lawson, "Paper-making in Wisconsin," State Historical Society of Wisconsin *Proceedings, 1909:* 273–81.

[4] *History of the Wisconsin Paper Industry,* 10–54; *Thirteenth Census of the United States,* 1910.

[5] O. D. Shelton, "General Economic History," in Adam Shortt and Arthur G. Doughty, eds., *Canada and Its Provinces* (23 vols., Toronto, 1914–1917), 9:220–32; W. E. Greening, *Papermakers in Canada* (Ontario, 1952), 2–5; Oscar T. Barck, Jr. and Nelson M. Blake, *Since 1900* (New York, 1947), 63–64, 125–26.

[6] Information supplied at Forest Products Laboratory; Milwaukee *Journal,* October 2, 1955; *Fifteenth Census of the United States,* 1930.

[7] Forest Products Laboratory, *Toward Wiser Use of Wood* (Madison, 1950 [?]); Folke Becker, "Trees For Tomorrow," *Wisconsin Magazine of History,* 36:43–48 (Autumn, 1952); *Wisconsin Conservation Bulletin* (February, 1956), 34; Madison *Capital Times,* February 9, 1956.

[8] *History of the Wisconsin Paper Industry,* 55–67; Fritz Publications, Inc., *Paper and Pulp Mill Catalog* (Chicago, 1954), 205–208, 222–23, 278, 380.

[10] "Log That Leads a Double Life," *Maralog* (Marathon Corporation, Menasha, January–February, 1954), 9; Information supplied at Forest Products Laboratory.

[11] Becker, "Trees For Tomorrow," 46–47; Milwaukee *Sentinel and Gazette,* March 27, 1848; L. D. Post, Inc., *Post's Paper Mill Directory* (New York, 1953), 373–89; Milwaukee *Journal,* October 2, 1955; Department of Commerce, *Annual Survey of Manufactures,* 1953.

BIBLIOGRAPHY

The only source that attempts a history of Wisconsin papermaking is Howard Publishing Company, *1848–1948, A History of the Wisconsin Paper Industry* (Chicago, 1948). This 76 page publication relates in some detail the various stages of Wisconsin companies.

Useful for a general picture of papermaking are Dard Hunter, *Papermaking in Pioneer America* (Philadelphia, 1952), which covers the colonial period; and Lockwood Trade Journal Company, Inc., *The Progress of Paper* (New York, 1947), which brings the story down to that date and includes considerable material on processes, changes and the various companies involved. It also has many pictures. Carl E. Curran, *The Story of Newsprint Paper* (New York, 1936) covers various aspects of the industry.

A number of films on the paper industry can be obtained from the University of Wisconsin Bureau of Visual Education. Best is "Papermaking" (Coronet, 20 minutes), which takes the viewer step by step through the process of making paper. Others include "Trees to Paper" (American Forest Products Industries, 12 minutes); "Paper" (Encyclopedia Britannica Films, 10 minutes); and "Trees to Tribune" (Chicago Tribune, 45 minutes). A film specifically on the Wisconsin industry is "Paper, Mister?" (Cooley Company, Milwaukee, 20 minutes). This is in color and is mainly concerned with the role of the industry in Wisconsin's economy.

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